Hadronisation Corrections to the Inclusive Jet Cross Section

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Introduction

Goal: Corrected NLO for Underlying Event and Fragmentation in order to get a fair comparison to data

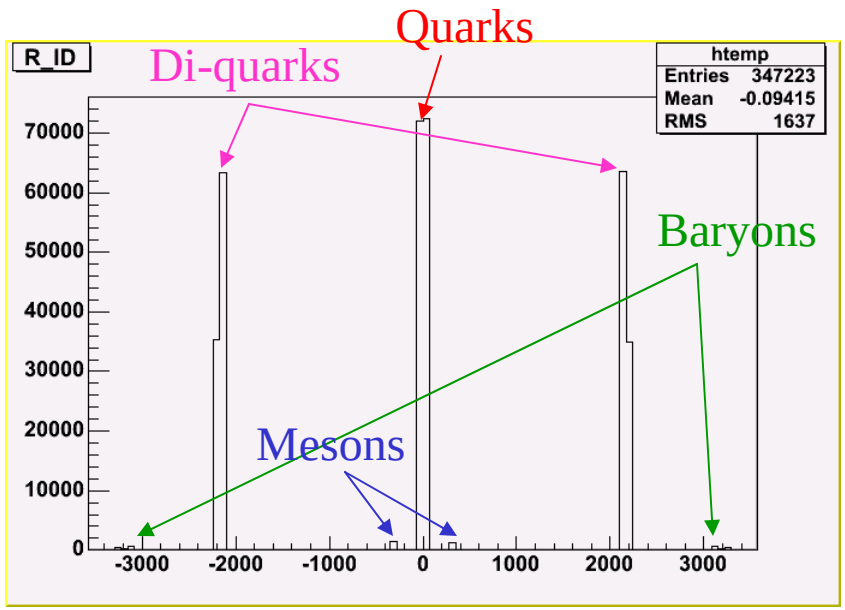
$$\text{NLO} \times \frac{\sigma\,(\text{Hadron Level - Pythia Tune A with MPI})}{\sigma\,(\text{Parton Level - Pythia Tune A no MPI})}$$

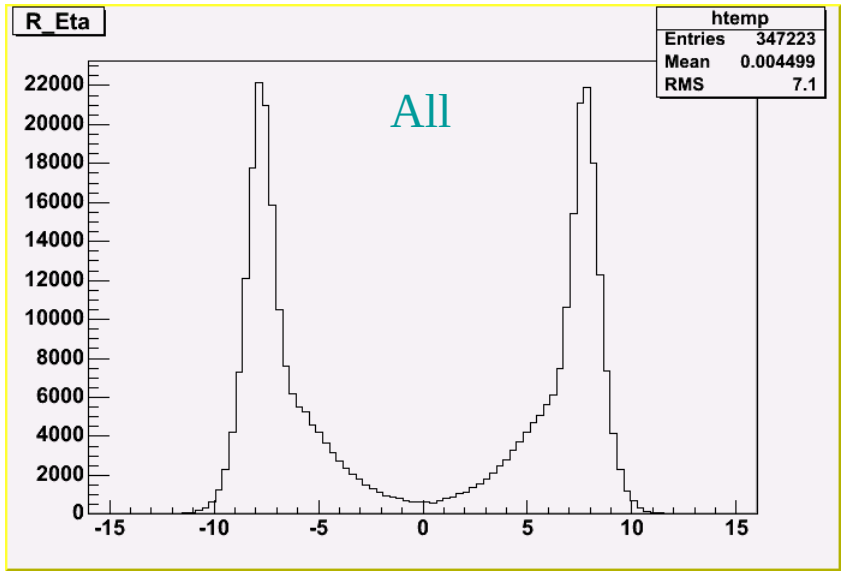
About beam remnants in Pythia

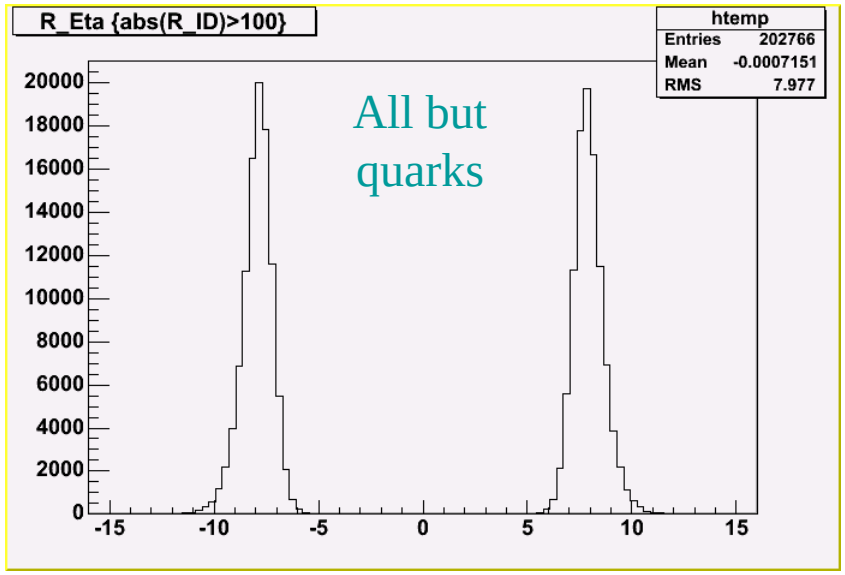
- Composition defined by incoming (before ISR) parton
- P_T just compensate P_T of incoming (before ISR) parton
- Can not be clearly isolated at hadron level (String Fragmentation)
- Easy to isolate at parton level
  - Mother = p or $\bar{p}$
  - Do not radiate or interact (Except for MPI: MPI products also easy to identified at parton level $\rightarrow$ Mothers = 0)

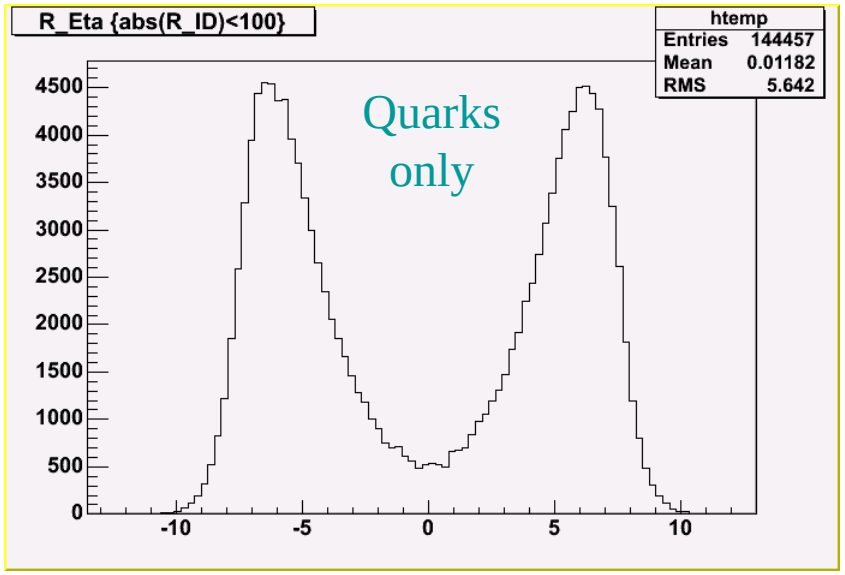
Beam-Beam remnants composition

(Pythia Tune A – min P_T = 3 GeV/c – 100000 events)



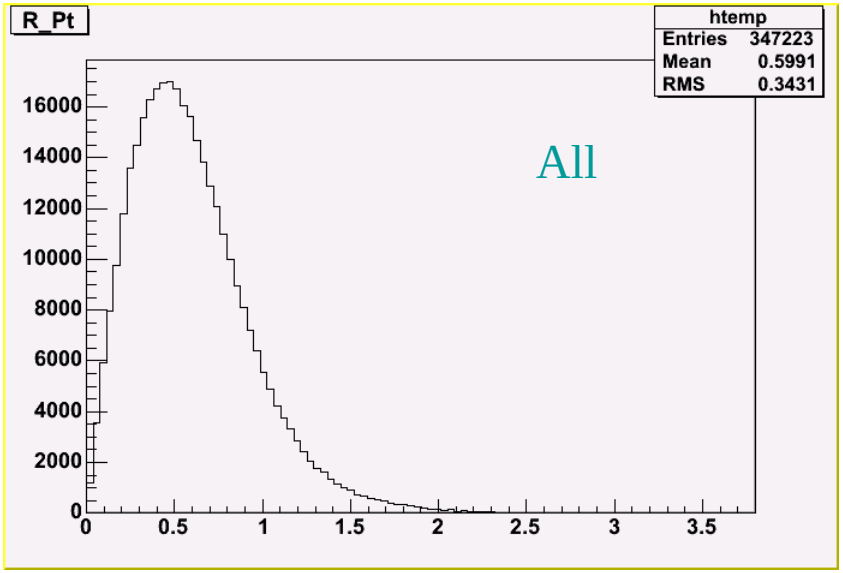


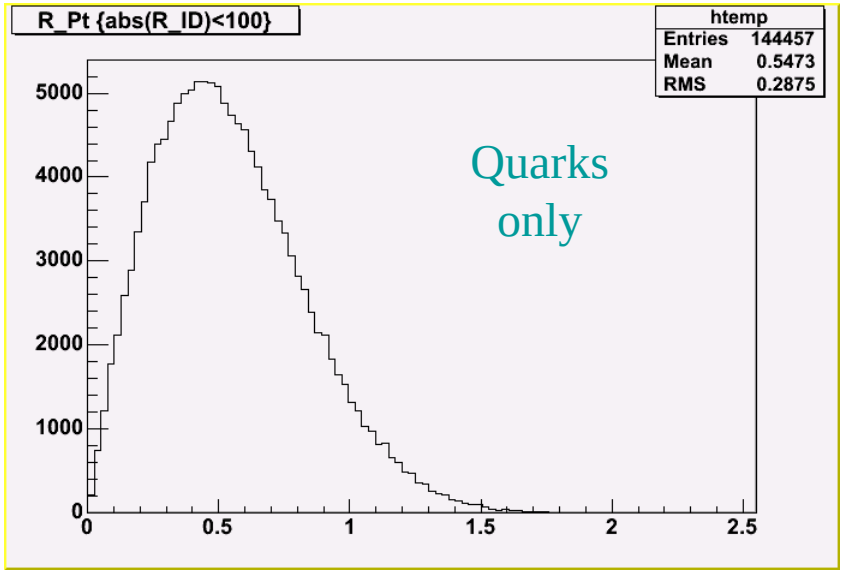


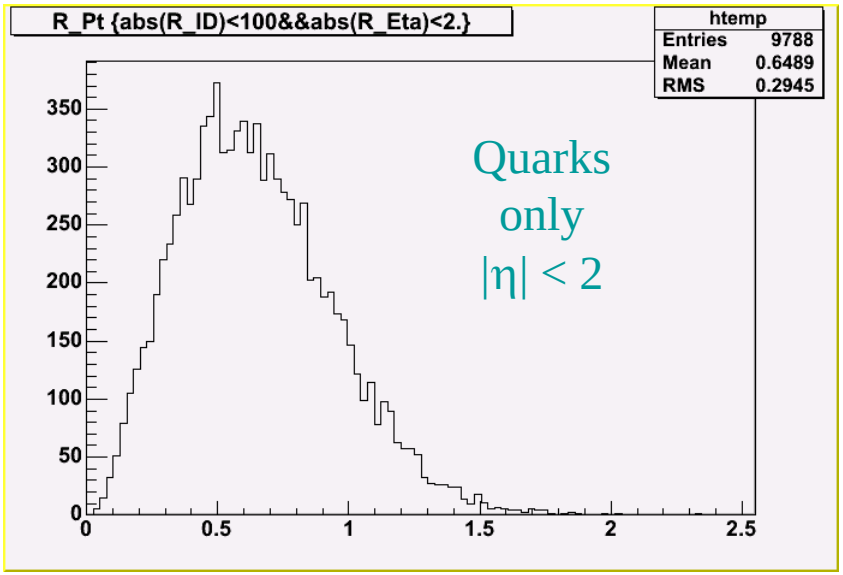


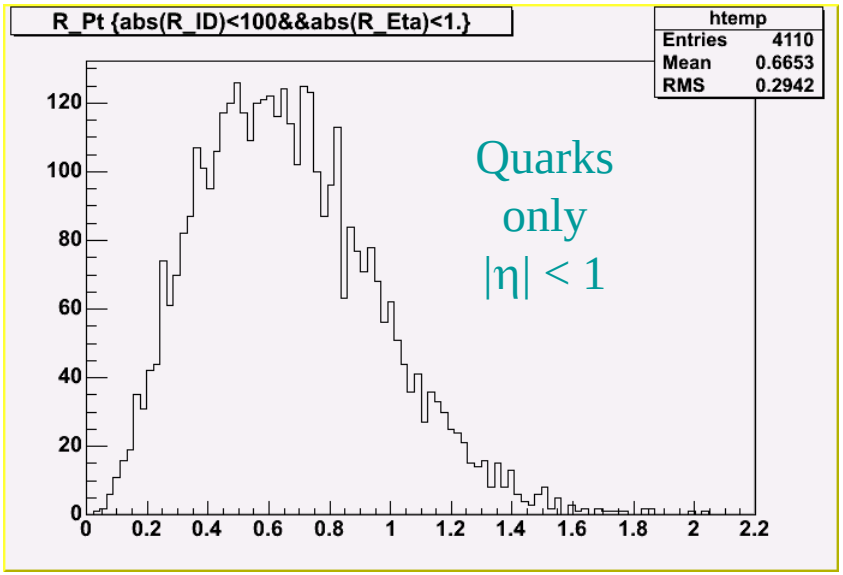
Beam-Beam remnants P_T spectrum

(Pythia Tune A – min P_T = 3 GeV/c – 100000 events)









Removing the beam-beam remnants to the parton level clusterisation

Why

Beam-beam remnants themselves have a small but non-null contribution even in the central region (quark type remnants)

In our case, should be removed because not included in NLO

How

- Reminder

  Clusterisation at parton level with Pythia require development version of Calor package

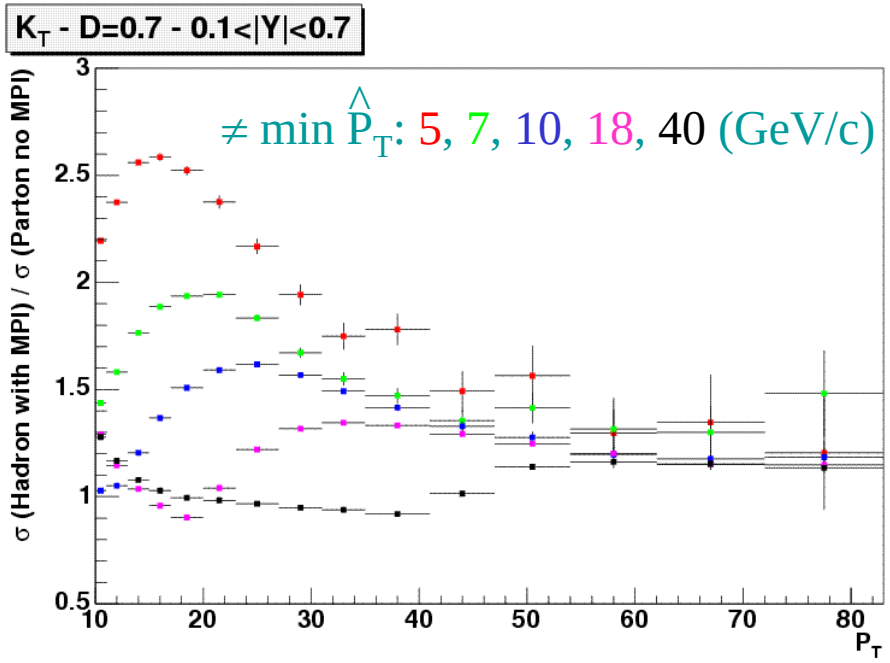
- Edit Calor/src/SourceHEPGPythiaPartons.cc

  In the loop storing the partons to be clusterised, add the requirement: jmo1hep!=1 && jmo1hep!=2

MC samples

Makes use of 162.5 millions events

- Official 5.3.3 Pythia Dijet Sample (19.5M)
- Samples generated for Jet Shape studies (28M)
- Samples generated by Giuseppe (6M)
- Additional samples especially generated (109M)



Convergence study only

Number of events (Millions)

min $\hat{P}_T$	with MPI	no MPI
3	10	10
5	10	10.5
7	10	10
10	11	10.5
18	14.3	5.5
40	8.2	5.5
60	5	5.5
90	5.5	5.5
120	4	2.5
150	3.5	2.5
200	3	2.5
300	1	1.5
400	1	1.5
500	1	1.5

☹ Convergence only above ~ 50 GeV/c

→ no correction provided here below

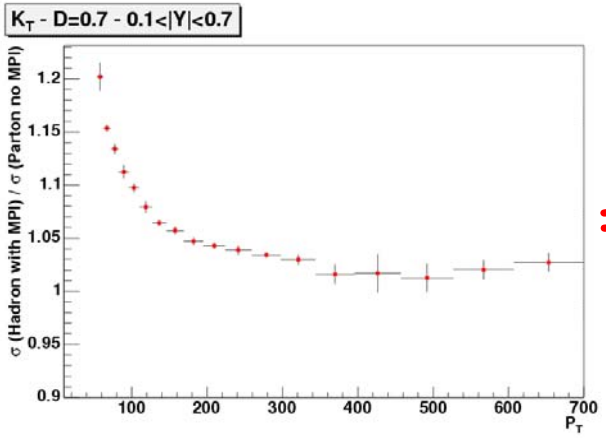
Correction decomposition

(K_T - D=0.7)

Global

Underlying Event

Fragmentation



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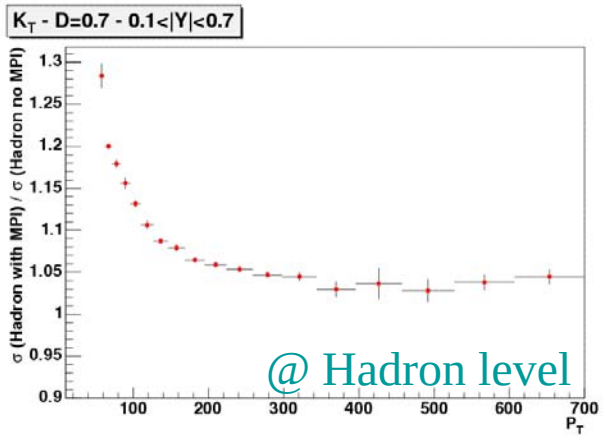

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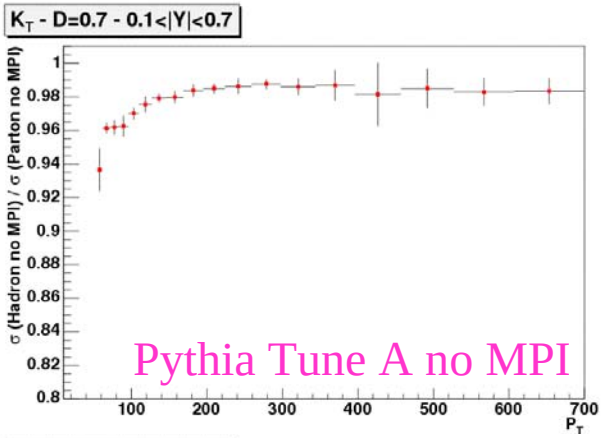

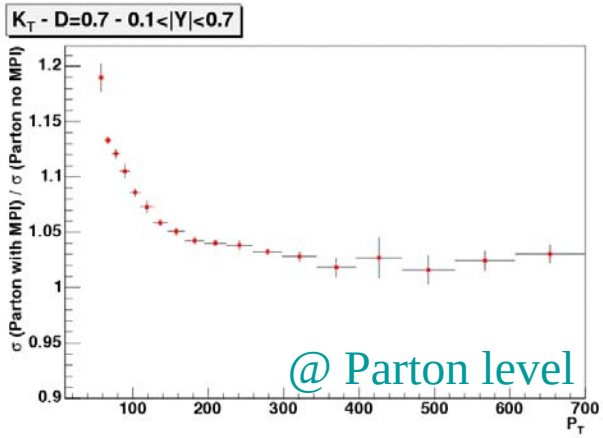

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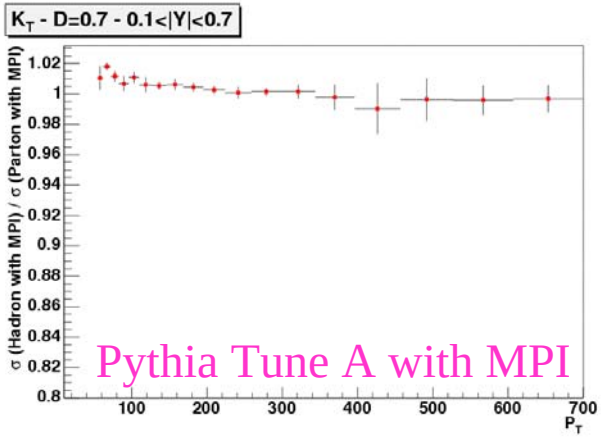
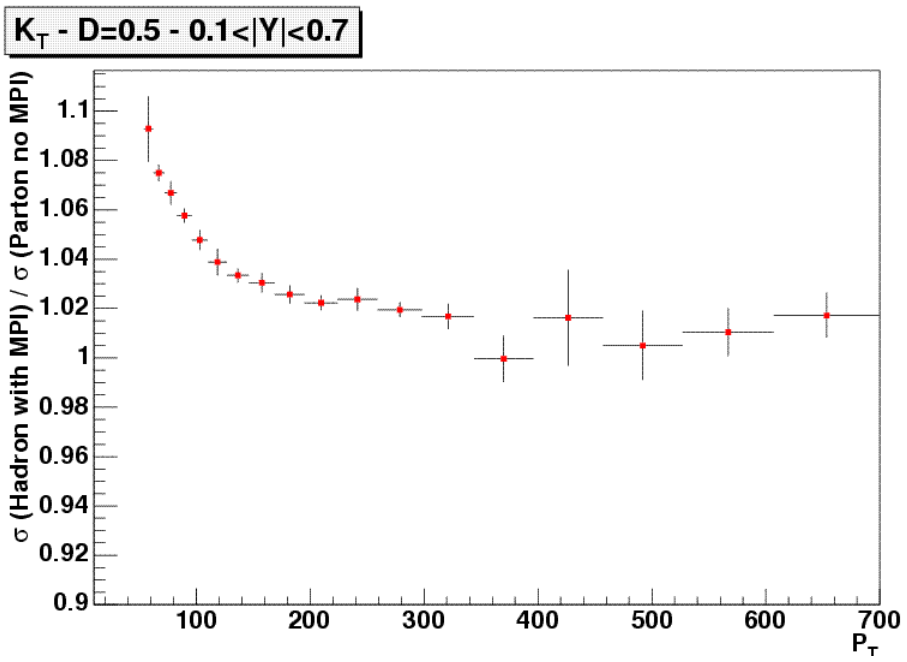
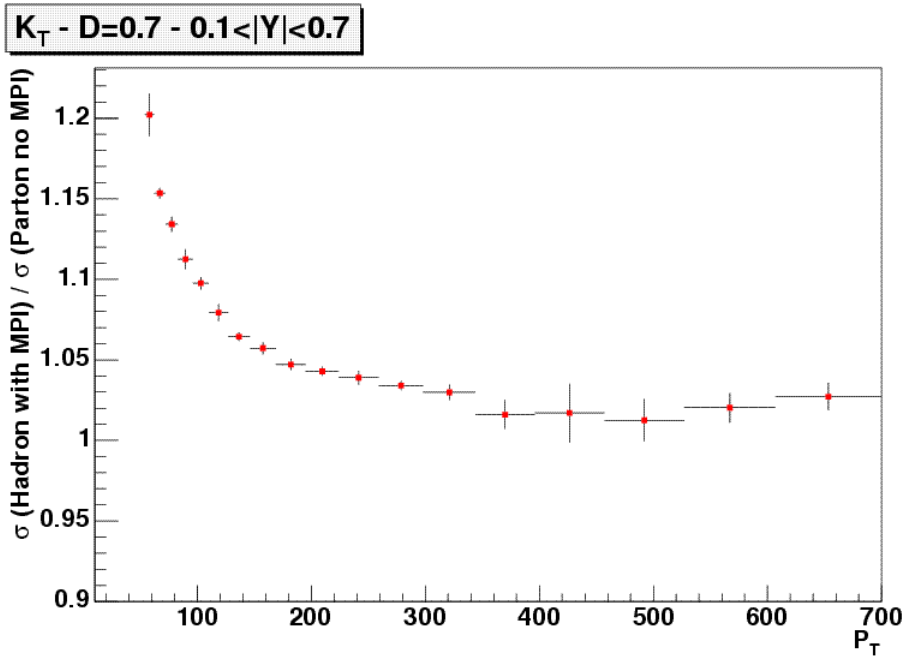


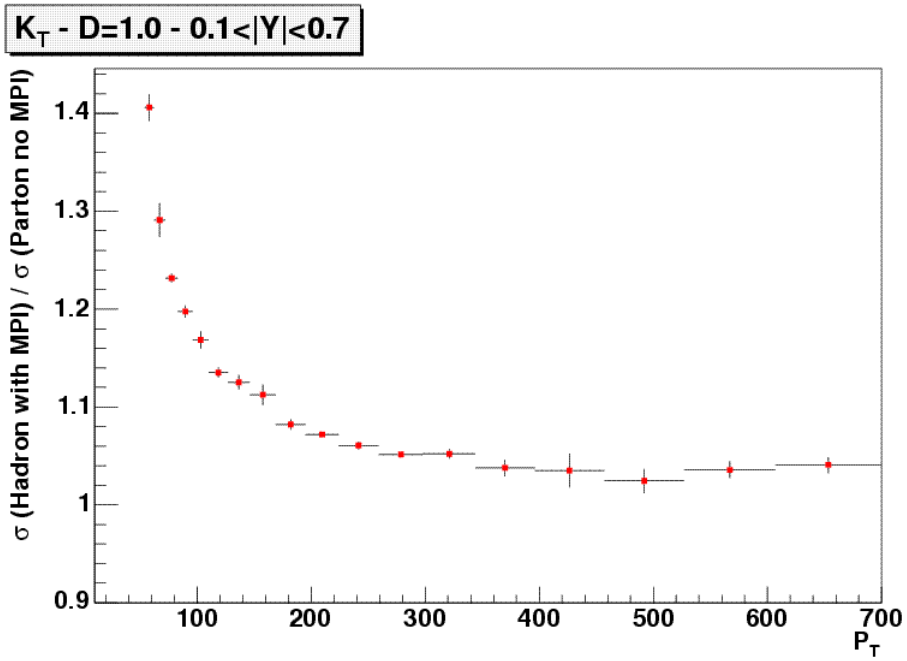
→ MPI correction only in Pythia framework

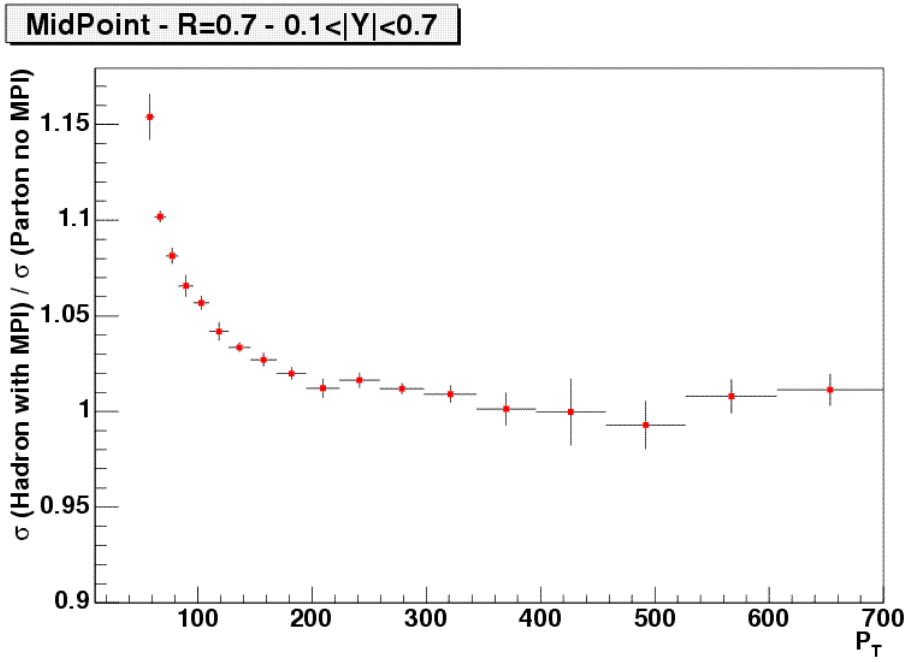
→ Beam-beam remnants correction accounted here

Global Correction for Central Jets



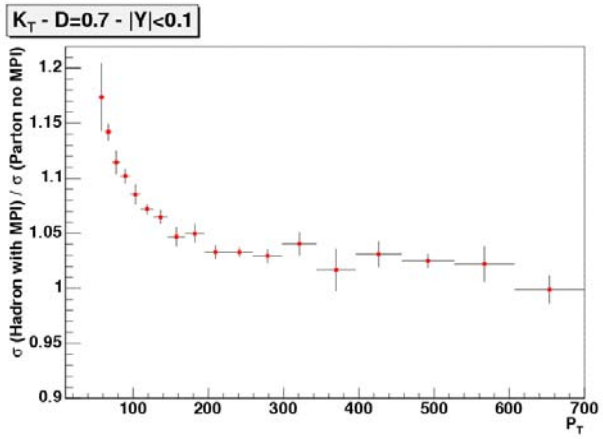


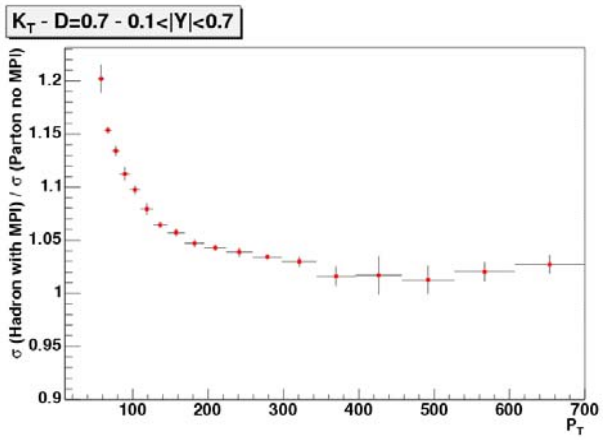


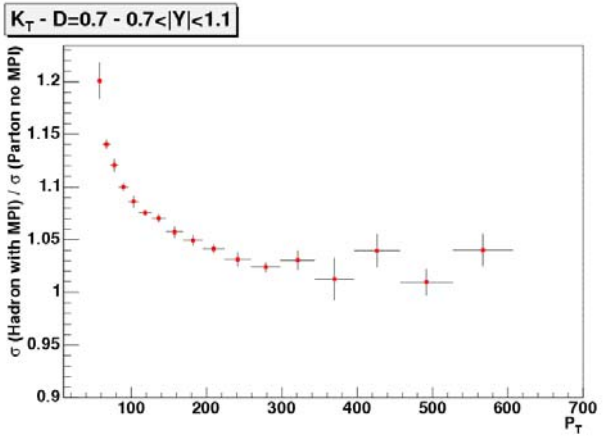


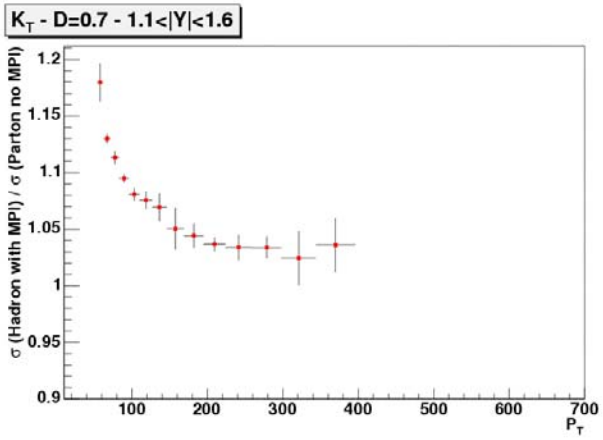
Global Correction vs. Rapidity

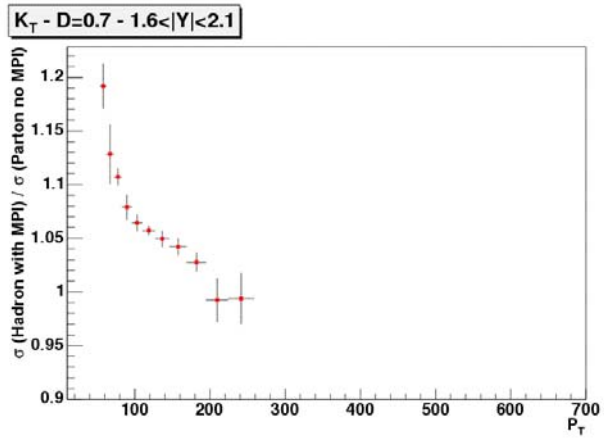
(K_T – D=0.7)











☺ Small rapidity dependency

Results on Central Jets with K_T

All Data up to COT compromised period

- 263 pb^{-1}
  - Datasets 0d (last Calorimeter Calibrations)
  - Version 5.3.3_nt of Zvertex module
- Still 4.9.1 MC
  - Jet Energy Corrections / Unfolding
  - Systematic as for blessing: still 5% on Jet Energy Scale…
- Corrected NLO calculations (bug found in previous calculations)

Not show here but already in hand

- Full 0d datasets (~ 400 pb^{-1})
- New MC

  Now Working on reduction of systematic

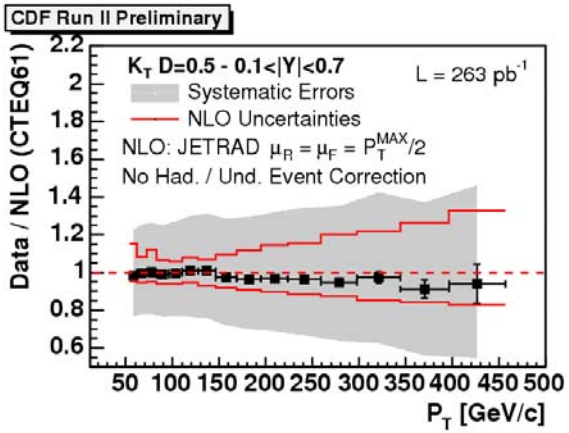
Plan: final results blessed and PRL draft by Moriond

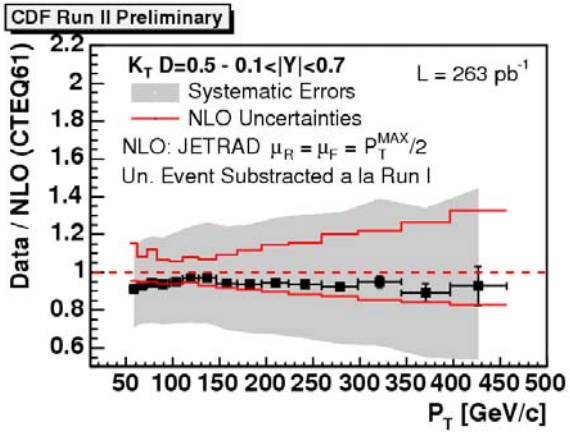
No Had. / UE Corr.

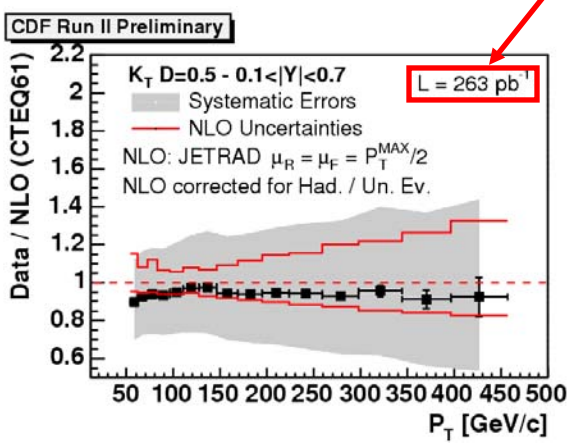
UE Sub. a la Run I

This Had. / UE Corr.

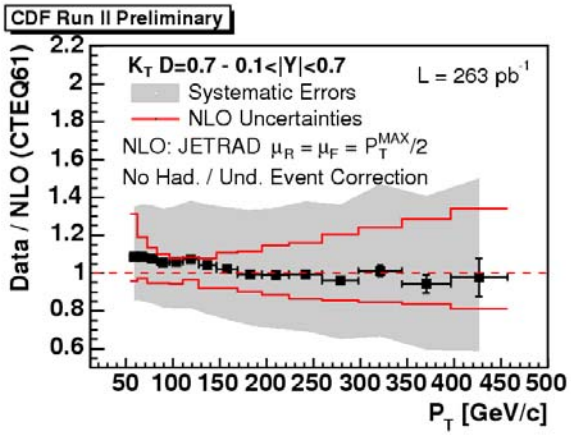
D=0.5

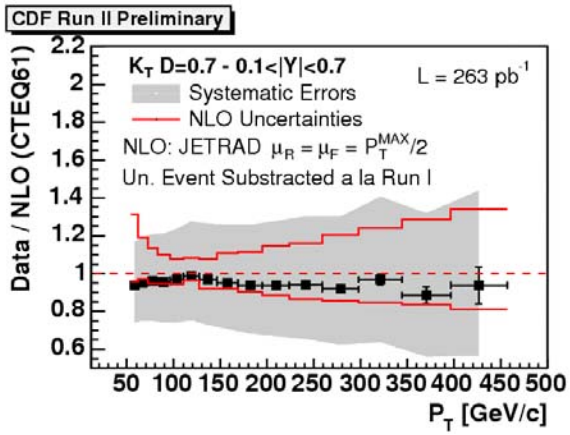


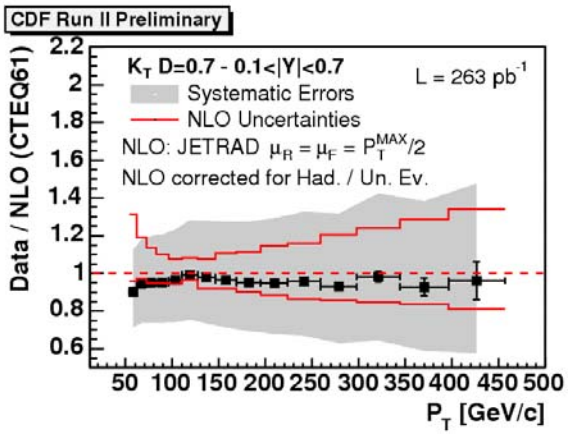




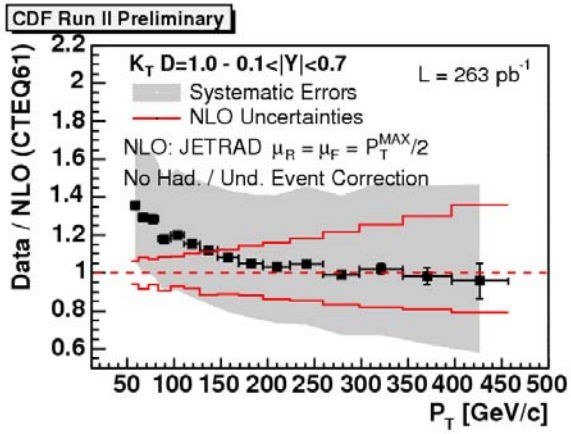
D=0.7

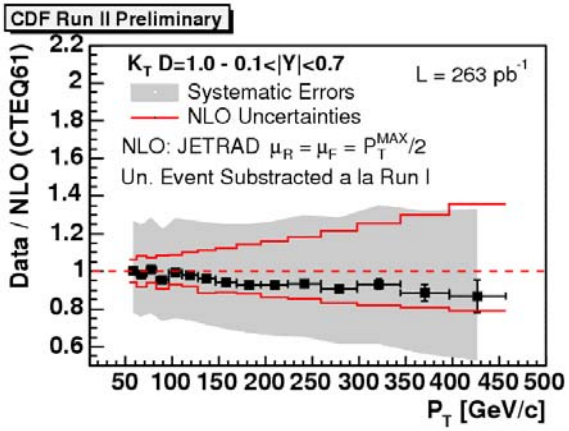


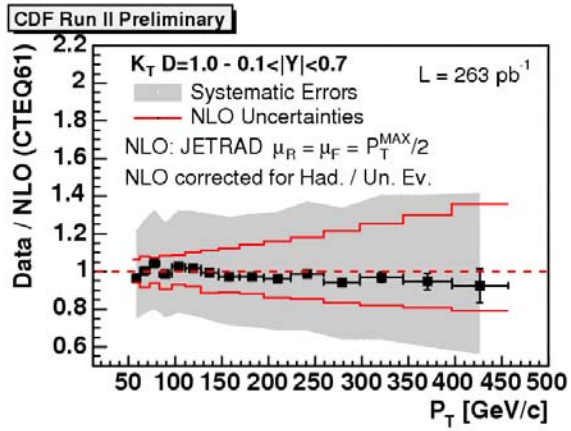




D=1.0

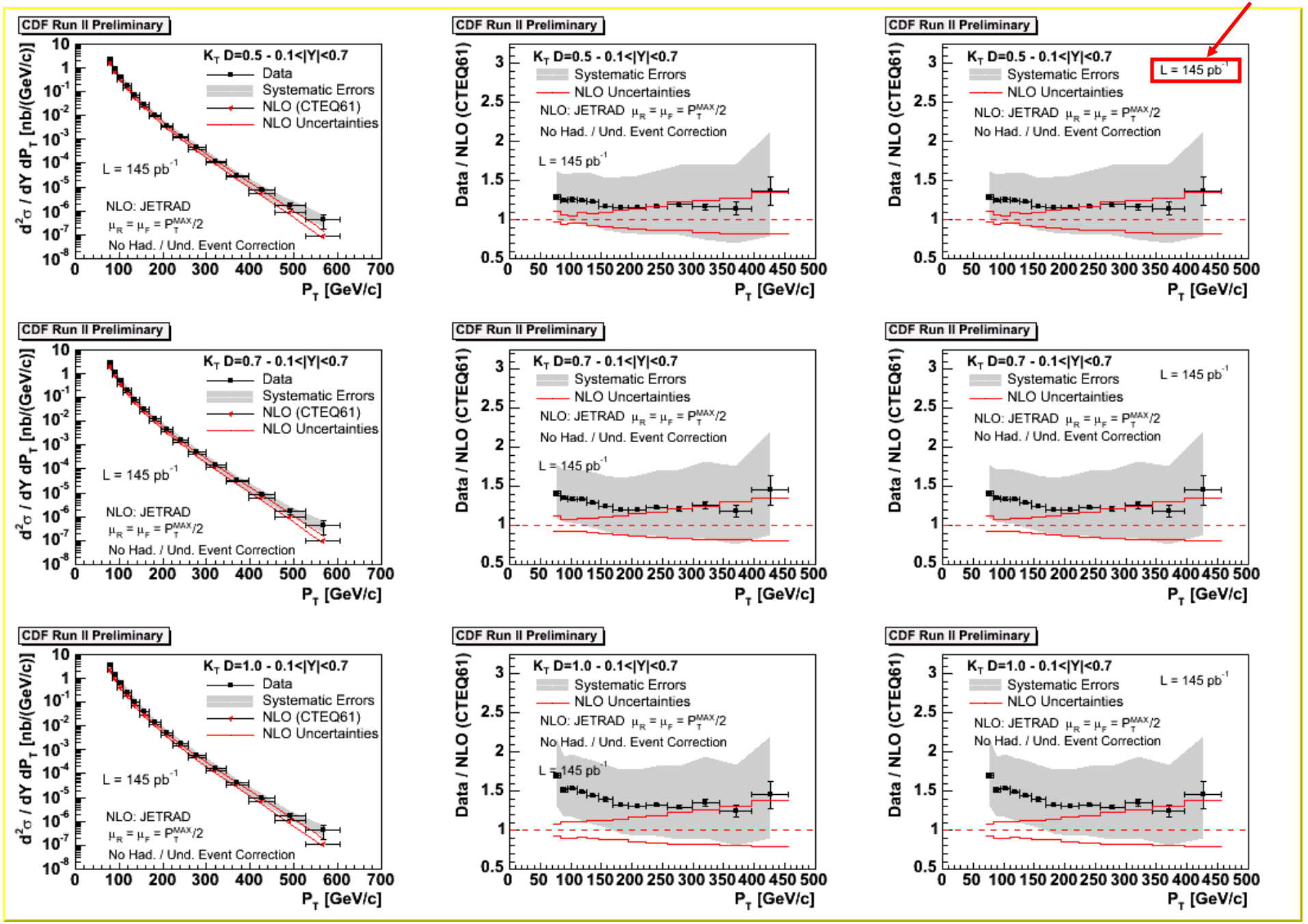






What about plots blessed in April?

Old Plots with a bug in NLO calculations



Proposed updated plots (Only NLO changed)